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ABSTRACT

This guide to Indiana's academic standards in English/Language Arts, Mathematics, Science, and the Social Studies for Grade 8 students begins with a note to students and another note to parents. The guide spells out what students should know and be able to do in each subject, at each grade level. The guide also lists 10 things parents can do to help students succeed and includes information on assessments or measures of student learning. It cites the following seven standards for English/Language Arts: (1) Reading: Word Recognition, Fluency, and Vocabulary Development; (2) Reading: Comprehension (Focus on Informational Materials); (3) Reading: Literary Response and Analysis; (4) Writing: Process; (5) Writing: Applications (Different Types of Writing and Their Characteristics); (6) Writing: English Language Conventions; and (7) Listening and Speaking: Skills, Strategies, and Applications. The guide lists these seven standards for Mathematics: Number Sense, Computation, Algebra and Functions, Geometry, Measurement, Data Analysis and Probability, and Problem Solving. It enumerates the following seven standards for Science: Nature of Science and Technology, Scientific Thinking, Physical Setting, Living Environment, Mathematical World, Historical Perspectives, and Common Themes. The guide lists these five standards for the Social Studies: History; Civics and Government; Geography; Economics; and Individuals, Society, and Culture. Attached are sheets for notes. (NKA)

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ED 477 627

Grade 8

Indiana's Academic Standards

English/Language Arts
Mathematics
Science
Social Studies

Adopted by the
Indiana State
Board of Education
2000 – 2001

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Dear Student,

The world is changing fast. In order for you to succeed in school, at work, and in the community, you will need more skills and knowledge than ever before.

Getting in shape academically is the single most important thing you can do to prepare for a successful future.

This booklet of Academic Standards clearly spells out what you should know and be able to do in each subject, at your grade level. Examples are given to help you understand what is required to meet the Standards. **Please review this guide with your teachers and share it with your parents and family.**

Whether you go on to be a surgeon, computer technician, teacher, or airplane mechanic, learning never stops. There will always be a more demanding computer application, a new invention, or a more complex project awaiting you.

To be ready for tomorrow — get in top academic shape today. Use this guide year round to check your progress.

Dear Parent,

The demand is greater than ever for people who can read, write, speak effectively, analyze problems and set priorities, learn new things quickly, take initiative, and work in teams. Technology has already transported us into a time where the next e-commerce opportunity is limited only by our imagination.

That's why Indiana has established new Academic Standards in English/language arts, mathematics, science, and social studies. These world-class Standards outline what your student should know and be able to do in each subject, at each grade level.

Indiana's new Academic Standards were recommended by Indiana's Education Roundtable and adopted by the State Board of Education. According to Achieve, Inc. and other respected education experts, these Standards are among the best in the nation.

Higher academic standards pose a challenge, but Indiana students have shown that they can measure up. Our students know that higher expectations lead to greater rewards — and they're prepared to work harder. We know that by setting specific goals, everyone wins. Teachers have clear targets, students know what's expected, and you have detailed information about your child's strengths and weaknesses.

How can you be sure that your student will be ready to meet these challenges? First, keep in mind that learning does not take place only in the classroom. Students spend far more time at home than they do in school. How they spend their time can make a real difference. That is where your help is the most important.

On the next page is a list of 10 things you can do to help your student get a good education. **Nothing will have a bigger impact on your student's success than your involvement in his or her education.** We hope you use this guide as a tool to help your child succeed today and in the future.

Sincerely,

Frank O'Bannon
Governor Frank O'Bannon

Dr. Suellen Reed
Dr. Suellen Reed,
Superintendent of Public Instruction

Stan Jones
Stan Jones,
Commissioner for Higher Education

10 things parents can do to help students succeed

1. **Build relationships with your child's teachers.** Find out what each teacher expects of your child and how you can help your child prepare to meet those expectations.

2. **Read.** Reading is the foundation for all learning. Read to your young child, encourage your older child to read to you, or spend time together as a family reading. All this helps your child develop strong reading habits and skills from the beginning and reinforces these habits and skills as your child grows. Reading is one of the most important contributions you can make to your child's education.

3. **Practice writing at home.** Letters, journal entries, e-mail messages, and grocery lists are all writing opportunities. Show that writing is an effective form of communication and that you write for a variety of purposes.

4. **Make math part of everyday life.** Cooking, gardening, paying bills, and even shopping are all good ways to help your child understand and use mathematics skills. Show that there may be many ways to get to the right answer and encourage your child to explain his or her method.

5. **Ask your child to explain his or her thinking.** Ask lots of "why" questions. Children should be able to explain their reasoning, how they came up with the right answer, and why they chose one answer over another.

6. **Expect that homework will be done.** Keep track of your child's homework assignments and regularly look at his or her completed work. Some teachers now give parents a number to call for a recorded message of that day's homework assignments; others put the information on the Internet. If your school doesn't offer these features, talk to the teacher about how you can get this important information. Even if there aren't specific assignments, find out how you can stay informed about what your child is working on so that you can help at home.

7. **Use the community as a classroom.** Feed your child's curiosity about the world 365 days a year. Use the library to learn more about the history of your town. A visit to a farmer's market can help your child picture our state's rich agricultural tradition. Take your young child to zoos and parks and your older child to museums and workplaces to show how learning connects to the real world.

8. **Encourage group study.** Open your home to your child's friends for informal study sessions. Promote outside formal study groups through church or school organizations or other groups. Study groups will be especially important as your child becomes older and more independent. The study habits your child learns now will carry over into college and beyond.

9. **Help other parents understand academic expectations.** Use your school and employee newsletters, athletic associations, booster clubs, a PTA or PTO meeting, or just a casual conversation to help other parents understand what academic standards mean for them, their children, and their school and how they can help their children learn at home.

10. **Spend time at school.** The best way to know what goes on in your child's school is to spend time there. If you're a working parent, this isn't easy, and you may not be able to do it very often. But "once in awhile" is better than "never."

Remember: *You are the most important influence on your child. Indiana's Academic Standards give you an important tool to ensure that your child gets the best education possible.*

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Measuring Student Learning

Children develop at different rates. Some take longer and need more help to learn certain skills. Assessments, like ISTEP+, help teachers understand how students are progressing and assist in identifying academic areas where students may need additional attention.

Assessments also provide a measure of school accountability – assisting schools in their efforts to align curriculum and instruction with the state's Academic Standards and reporting progress to parents and the public. Students in designated grades take ISTEP+ in the fall of each school year – with the assessment based on what the child should have learned and retained from the previous year.

Core 40 End-of-Course Assessments are given at the end of specific high school classes and are a cumulative assessment of what students should have learned during that course. End-of-Course Assessments also provide a means to ensure the quality and rigor of high school courses across the state. Voluntary for schools at this time, a selection of these assessments will be phased in over the next five years.

◗ Indicates mandatory ISTEP+ testing ♦ Indicates voluntary assessments

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4
	♦Reading	♦Reading	◗ English/Lang. Arts ◗ Mathematics	

What's the Goal? By Grade 4, have students moved beyond learning to read toward "reading to learn" other subjects? Can each student write a short, organized essay? Can each student use math skills to solve everyday, real-world problems?

Grade 5	Grade 6	Grade 7	Grade 8
◗ Science (begins 2003) ◗ Social Studies (begins 2004)	◗ English/Lang. Arts ◗ Mathematics	◗ Science (begins 2005) ◗ Social Studies (begins 2006)	◗ English/Lang. Arts ◗ Mathematics

What's the Goal? By Grades 7 and 8, have students developed strong enough study habits in English and math skills to be ready for high school?

Grade 9	Grade 10 (GQE)	Grade 11	Grade 12	Graduation
◗ Science (begins 2007) ◗ Social Studies (begins 2008)	◗ English/Lang. Arts ◗ Mathematics	(two re-tests available for those who have not passed the GQE)	(two re-tests available for those who have not passed the GQE)	(or continued extra help)
♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	♦Core 40 End-of-Course Assessments	

What's the Goal?
By Grade 12, can students read well enough to pass a driver's exam, understand an appliance manual, or compare two opposing newspaper editorials? Could students write an effective job application letter? By testing skills like these in Grade 10, teachers know whether – and in which skill area – students need more attention before it's time to graduate.

For more information visit www.doe.state.in.us/standards and click on Assessment or call 1-800-54-ISTEP (1-888-544-7837).

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Grade 8

English/Language Arts

Standard 1

READING: Word Recognition, Fluency, and Vocabulary Development

Students use their knowledge of word parts and word relationships, as well as context clues (the meaning of the text around a word), to determine the meaning of specialized vocabulary and to understand the precise meaning of grade-level-appropriate words.

Vocabulary and Concept Development

8.1.1 Analyze idioms and comparisons — such as analogies, metaphors, and similes — to infer the literal and figurative meanings of phrases.

- Idioms: expressions that cannot be understood just by knowing the meanings of the words in the expression, such as *to be an old hand at something* or *to get one's feet wet*
- Analogies: comparisons of the similar aspects of two different things
- Metaphors: implied comparisons, such as *The stars were brilliant diamonds in the night sky*
- Similes: comparisons that use *like* or *as*, such as *The stars were like a million diamonds in the sky*

8.1.2 Understand the influence of historical events on English word meaning and vocabulary expansion.

Example: Recognize how the early influences of Spanish explorers in North America expanded American English vocabulary, adding words such as *tornado*, *tomato*, and *patio*.

8.1.3 Verify the meaning of a word in its context, even when its meaning is not directly stated, through the use of definition, restatement, example, comparison, or contrast.

Example: Understand the meaning of *pickle* in a sentence, such as *The pickle was an important part of metal working.* Use a dictionary to help clarify the use of the word *pickle* in this context.

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Standard 2

READING: Comprehension

(Focus on Informational Materials)

Students read and understand grade-level-appropriate material. They describe and connect the essential ideas, arguments, and perspectives of the text by using their knowledge of text structure, organization, and purpose. The selections in the **Indiana Reading List** *(available online at www.doe.state.in.us/standards/readinglist.html) illustrate the quality and complexity of the materials to be read by students. At Grade 8, in addition to regular classroom reading, students read a variety of narrative (story) and expository (informational and technical) texts, including classic and contemporary literature, poetry, magazines, newspapers, reference materials, and online information.*

Structural Features of Informational and Technical Materials

8.2.1 Compare and contrast the features and elements of consumer materials to gain meaning from documents.

Example: Compare examples of a variety of instructional or technical manuals, such as those for a computer, hair appliance, camera, or electronic game, brought to class by different students. Describe what features make certain instructions easier than others to understand and follow.

8.2.2 Analyze text that uses proposition (statement of argument) and support patterns.

Example: Read and analyze the organization of the "pro" and the "con" editorials on a topic of interest in *USA Today*. In each, decide if the argument is simply and clearly stated. Decide if there are at least three major points in support of the argument, with the strongest argument given first.

Comprehension and Analysis of Grade-Level-Appropriate Text

8.2.3 Find similarities and differences between texts in the treatment, amount of coverage, or organization of ideas.

Example: Read articles on the same current topic in magazines, such as *Time* and *Newsweek*, and editorials in national or local newspapers. Compare and contrast the texts in how they present the issue.

8.2.4 Compare the original text to a summary to determine whether the summary accurately describes the main ideas, includes important details, and conveys the underlying meaning.

Example: After writing summaries or creating graphic organizers on an informational text read for class, exchange the summary or organizer with another student. Evaluate this classmate's summary, based on how well the student describes the most important elements of the text.

8.2.5 Use information from a variety of consumer and public documents to explain a situation or decision and to solve a problem.

Example: Decide which is the most practical and economical wireless telephone to purchase by reading articles, brochures, Web pages, and other consumer sources, such as *Consumer Reports*.

Expository (Informational) Critique

8.2.6 Evaluate the logic, internal consistency, and structural patterns of text.

Example: Read *The Brooklyn Bridge: They Said It Couldn't Be Built* by Judith St. George and evaluate the techniques and the effectiveness of the development of the main idea of the book.

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Standard 3

READING: Literary Response and Analysis

Students read and respond to grade-level-appropriate historically or culturally significant works of literature that reflect and enhance their study of history and social science. They clarify the ideas and connect them to other literary works. The selections in the **Indiana Reading List** *(available online at www.doe.state.in.us/standards/readinglist.html) illustrate the quality and complexity of the materials to be read by students.*

Structural Features of Literature

8.3.1 Determine and articulate the relationship between the purposes and characteristics of different forms of poetry (including ballads, lyrics, couplets, epics, elegies, odes, and sonnets).

- Ballad: a poem that tells a story
- Lyric: words set to music
- Couplet: two successive lines of verse that rhyme
- Epic: a long poem that describes heroic deeds or adventures
- Elegy: a mournful poem for the dead
- Ode: a poem of praise
- Sonnet: a rhymed poem of 14 lines

Example: Describe the different forms of poetry. Compare poems such as John Ciardi's "Elegy for Jog," Pablo Neruda's "Odes to Common Things," and Edgar Allan Poe's sonnet "To Science."

Narrative Analysis of Grade-Level-Appropriate Text

8.3.2 Evaluate the structural elements of the plot, such as subplots, parallel episodes, and climax; the plot's development; and the way in which conflicts are (or are not) addressed and resolved.

Example: Read a book, such as *Holes* by Louis Sachar, and discuss how the plot is developed, including the climax and its resolution and how different subplots are incorporated into the story.

8.3.3 Compare and contrast the motivations and reactions of literary characters from different historical eras confronting either similar situations and conflicts or similar hypothetical situations.

Example: Compare books that deal with the theme of the impact of war, both on those who fight in the battles and those who remain at home. Books on this theme include books on the Civil War period, such as *Bull Run* by Paul Fleischman, books on World War I, such as *After the Dancing Days* by Margaret Rostkowski, or about the Vietnam War, such as *Park's Quest* by Katherine Patterson.

8.3.4 Analyze the importance of the setting to the mood, tone, and meaning of the text.

Example: Discuss the importance of the setting, including the place, the time period, and the customs, to books, such as *Friendly Persuasion* by Jessamyn West or *Stranded* by Ben Mikaelsen.

8.3.5 Identify and analyze recurring themes (such as good versus evil) that appear frequently across traditional and contemporary works.

Example: Explore the theme that heroism demands unusual courage and risk-taking. Read fiction and biographies, such as Rod Serling's television play *Requiem for a Heavyweight* and David Remnick's *King of the World: Muhammed Ali and the Rise of an American Hero*, to identify what both real and imaginary heroes have done.

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8.3.6 Identify significant literary devices, such as metaphor, symbolism, dialect or quotations, and irony, which define a writer's style and use those elements to interpret the work.

- Metaphor: an implied comparison in which a word or phrase is used in place of another, such as *He was drowning in money.*
- Symbolism: the use of an object to represent something else; for example, a dove might symbolize peace
- Dialect: the vocabulary, grammar, and pronunciation used by people in different regions
- Irony: the use of words to express the opposite of the literal meaning of the words, often to be humorous

Example: Read several short stories by Mark Twain and discuss his use of dialect in his stories. Watch Alan Jay Lerner and Frederick Loewe's musical *My Fair Lady*, an adaptation of Bernard Shaw's *Pygmalion*, and discuss how the musical presents dialect and how this dialect is important to the conflict in the story.

Literary Criticism

8.3.7 Analyze a work of literature, showing how it reflects the heritage, traditions, attitudes, and beliefs of its author.

Example: Read a short biography of Edgar Allan Poe, Jack London, Shirley Jackson, Helen Keller, or Maya Angelou. Analyze how the author's experiences can be used to interpret his or her writings.

Standard 4

WRITING: Process

Students discuss, list, and graphically organize writing ideas. They write clear, coherent, and focused essays. Students progress through the stages of the writing process and proofread, edit, and revise writing.

Organization and Focus

8.4.1 Discuss ideas for writing, keep a list or notebook of ideas, and use graphic organizers to plan writing.

8.4.2 Create compositions that have a clear message, a coherent thesis (a statement of position on the topic), and end with a clear and well-supported conclusion.

8.4.3 Support theses or conclusions with analogies (comparisons), paraphrases, quotations, opinions from experts, and similar devices.

Research and Technology

8.4.4 Plan and conduct multiple-step information searches by using computer networks.

8.4.5 Achieve an effective balance between researched information and original ideas.

8.4.6 Use a computer to create documents by using word-processing skills and publishing programs; develop simple databases and spreadsheets to manage information and prepare reports.

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Evaluation and Revision

8.4.7 Review, evaluate, and revise writing for meaning and clarity.

8.4.8 Edit and proofread one's own writing, as well as that of others, using an editing checklist or set of rules, with specific examples of corrections of frequent errors.

8.4.9 Revise writing for word choice; appropriate organization; consistent point of view; and transitions among paragraphs, passages, and ideas.

Standard 5

WRITING: Applications

(Different Types of Writing and Their Characteristics)

At Grade 8, students continue to write narrative (story), expository (informational), persuasive, and descriptive essays of at least 750 to 1,000 words. Students are introduced to writing technical documents. Student writing demonstrates a command of Standard English and the research, organizational, and drafting strategies outlined in Standard 4 — Writing Process. Writing demonstrates an awareness of the audience (intended reader) and purpose for writing.

In addition to producing the different writing forms introduced in earlier grades, such as letters, Grade 8 students use the writing strategies outlined in Standard 4 — Writing Process to:

8.5.1 Write biographies, autobiographies, and short stories that:
- tell about an incident, event, or situation by using well-chosen details.
- reveal the significance of, or the writer's attitude about, the subject.
- use narrative and descriptive strategies, including relevant dialogue, specific action, physical description, background description, and comparison or contrast of characters.

Example: Write an autobiographical account of one of your most memorable first days of school. Describe the day and its importance clearly enough so the reader can see and feel the day from your perspective.

8.5.2 Write responses to literature that:
- demonstrate careful reading and insight into interpretations.
- connect response to the writer's techniques and to specific textual references.
- make supported inferences about the effects of a literary work on its audience.
- support judgments through references to the text, other works, other authors, or to personal knowledge.

Example: After reading *The Giver* by Lois Lowry, write a final chapter to the book, describing what happens to the main character after the point where Lowry ends the book. Then, plan a class presentation explaining the new ending, and how it is supported by the rest of the book.

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8.5.3 Write research reports that:

- define a thesis (a statement of position on the topic).
- include important ideas, concepts, and direct quotations from significant information sources, including print reference materials and the Internet, and paraphrase and summarize all perspectives on the topic, as appropriate.
- use a variety of primary and secondary sources and distinguish the nature and value of each.
- organize and display information on charts, tables, maps, and graphs.
- document sources with reference notes and a bibliography.

Example: Research the topic of the benefits and drawbacks of public transportation. Conduct research to learn why some experts argue that we should use more public transportation. Survey parents and friends to find out how often they use public transportation for school, business, or pleasure travel. Summarize the findings and write a report on the pros and cons of public transportation, including charts and graphs to support your findings.

8.5.4 Write persuasive compositions that:

- include a well-defined thesis that makes a clear and knowledgeable appeal.
- present detailed evidence, examples, and reasoning to support effective arguments and emotional appeals.
- provide details, reasons, and examples, arranging them effectively by anticipating and answering reader concerns and counter-arguments.

Example: Using the research completed on public transportation, write a persuasive letter to the mayor on why the community should or should not invest more resources into public transportation.

8.5.5 Write technical documents that:

- identify the sequence of activities needed to design a system, operate a tool, or explain the bylaws of an organization's constitution or guidelines.
- include all the factors and variables that need to be considered.
- use formatting techniques, including headings and changing the fonts (typeface) to aid comprehension.

Example: Write a report of a science experiment that was conducted in class, describing both the process and the scientific conclusions. Describe the steps clearly, using precise scientific vocabulary, so that another reader could follow exactly what the experiment involved and could understand the reasoning behind the conclusion. Add graphics and text design to make the content clearer and easier to follow.

8.5.6 Write using precise word choices to make writing interesting and exact.

Example: Write stories, reports, articles, and letters using a variety of word choices. (Use *adequately* instead of *enough*. Use *encyclopedia* or *mystery novel* instead of *book*.)

8.5.7 Write for different purposes and to a specific audience or person, adjusting tone and style as necessary.

Example: Write a letter to the editor in response to an opinion column in your school or community newspaper.

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Standard 6

WRITING: English Language Conventions

Students write using Standard English conventions appropriate to this grade level.

Sentence Structure

8.6.1 Use correct and varied sentence types (simple, compound, complex, and compound-complex) and sentence openings to present a lively and effective personal style.

8.6.2 Identify and use parallelism (use consistent elements of grammar when compiling a list) in all writing to present items in a series and items juxtaposed for emphasis.

- Correct: *Students having difficulty and needing help should stay after class.*
- Incorrect: *Students having difficulty and who need help should stay after class.*

8.6.3 Use subordination, coordination, noun phrases that function as adjectives (*These gestures — acts of friendship — were noticed but not appreciated.*) and other devices to indicate clearly the relationship between ideas.

Grammar

8.6.4 Edit written manuscripts to ensure that correct grammar is used.

Punctuation

8.6.5 Use correct punctuation.

Capitalization

8.6.6 Use correct capitalization.

Spelling

8.6.7 Use correct spelling conventions.

Standard 7

LISTENING AND SPEAKING: Skills, Strategies, and Applications

Students deliver focused, coherent presentations that convey ideas clearly and relate to the background and interests of the audience. They evaluate the content of oral communication. Students deliver well-organized formal presentations using traditional speech strategies, including narration, exposition, persuasion, and description. Students use the same Standard English conventions for oral speech that they use in their writing.

Comprehension

8.7.1 Paraphrase (restate) a speaker's purpose and point of view and ask questions concerning the speaker's content, delivery, and attitude toward the subject.

Organization and Delivery of Oral Communication

8.7.2 Match the message, vocabulary, voice modulation (changes in tone), expression, and tone to the audience and purpose.

8.7.3 Outline the organization of a speech, including an introduction; transitions, previews, and summaries; a logically developed body; and an effective conclusion.

8.7.4 Use precise language, action verbs, sensory details, appropriate and colorful modifiers (describing words, such as adverbs and adjectives), and the active (*I recommend that you write drafts.*) rather than the passive voice (*The writing of drafts is recommended.*) in ways that enliven oral presentations.

8.7.5 Use appropriate grammar, word choice, enunciation (clear speech), and pace (timing) during formal presentations.

8.7.6 Use audience feedback, including both verbal and nonverbal cues, to reconsider and modify the organizational structure and/or to rearrange words and sentences for clarification of meaning.

Analysis and Evaluation of Oral and Media Communications

8.7.7 Analyze oral interpretations of literature, including language choice and delivery, and the effect of the interpretations on the listener.

8.7.8 Evaluate the credibility of a speaker, including whether the speaker has hidden agendas or presents slanted or biased material.

8.7.9 Interpret and evaluate the various ways in which visual image makers (such as graphic artists, illustrators, and news photographers) communicate information and affect impressions and opinions.

Speaking Applications

8.7.10 Deliver narrative (story) presentations, such as biographical or autobiographical information that:

- relate a clear incident, event, or situation by using well-chosen details.
- reveal the significance of the incident, event, or situation.
- use narrative and descriptive strategies to support the presentation, including relevant dialogue, specific action, physical description, background description, and comparison or contrast of characters.

8.7.11 Deliver oral responses to literature that:
- interpret a reading and provide insight.
- connect personal responses to the writer's techniques and to specific textual references.
- make supported inferences about the effects of a literary work on its audience.
- support judgments through references to the text, other works, other authors, or personal knowledge.

8.7.12 Deliver research presentations that:
- define a thesis (a position on the topic).
- research important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize important perspectives on the topic.
- use a variety of research sources and distinguish the nature and value of each.
- present information on charts, maps, and graphs.

8.7.13 Deliver persuasive presentations that:
- include a well-defined thesis (position on the topic).
- differentiate fact from opinion and support arguments with detailed evidence, examples, reasoning, and persuasive language.
- anticipate and effectively answer listener concerns and counter-arguments through the inclusion and arrangement of details, reasons, examples, and other elements.
- maintain a reasonable tone.

8.7.14 Recite poems (of four to six stanzas), sections of speeches, or dramatic soliloquies (sections of plays in which characters speak out loud to themselves) using voice modulation, tone, and gestures expressively to enhance the meaning.

Grade 8

Mathematics

Mathematics

In this technological age, mathematics is more important than ever. When students leave school, they are more and more likely to use mathematics in their work and everyday lives — operating computer equipment, planning timelines and schedules, reading and interpreting data, comparing prices, managing personal finances, and completing other problem-solving tasks. What they learn in mathematics and how they learn it will provide an excellent preparation for a challenging and ever-changing future.

The state of Indiana has established the following mathematics Standards to make clear to teachers, students, and parents what knowledge, understanding, and skills students should acquire in Grade 8:

Standard 1 — Number Sense

Understanding the number system is the basis of mathematics. Students extend their understanding of irrational numbers, such as π and the square root of 2, learning the relationship between the nature of the decimal of a number and whether it is rational or irrational. They use negative exponents to write decimals in scientific notation, and they use the inverse relationship between squaring and finding a square root to calculate approximate square roots.

Standard 2 — Computation

Fluency in computation is essential. Students add, subtract, multiply, and divide rational numbers. They use percentages to calculate simple and compound interest. They also use mental arithmetic to compute with fractions, decimals, powers, and percentages.

Standard 3 — Algebra and Functions

Algebra is a language of patterns, rules, and symbols. Students at this level write and solve linear equations and inequalities, including solving pairs of linear equations by the substitution method. They use properties of the rational numbers to evaluate and simplify algebraic expressions. They further extend their understanding of the relationship between equations and graphs by connecting slopes to rates of change and by drawing graphs of quadratic functions and simple cubic functions.

Standard 4 — Geometry

Students learn about geometric shapes and develop a sense of space. They learn new concepts relating to shapes, such as altitudes, bisectors, and chords and perform constructions connected with them. They further develop their sense of three-dimensional space by investigating how objects intersect in space. They draw a wide range of transformations of shapes, and they apply the Pythagorean Theorem and its converse to problems in two- and three-dimensions.

Standard 5 — Measurement

The study of measurement is essential because of its uses in many aspects of everyday life. Students convert common measurements for lengths, areas, volumes, weights, capacities, and times. They develop and use the concept of rate and derived measures — e.g., velocity and density. They apply the concepts of similarity, ratio, and proportion to problems involving scale factors, areas, and volumes. They find areas, perimeters, volumes, and surface areas, including those of irregular shapes made up of more basic shapes.

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Standard 6 — Data Analysis and Probability

Data are all around us — in newspapers and magazines, in television news and commercials, in quality control for manufacturing — and students need to learn how to understand data. At this level, they evaluate whether claims based on data are reasonable and employ various sampling methods, analyzing their strengths and weaknesses. They understand the concepts of the median and quartiles and use these measures to draw and analyze box-and-whisker plots. They represent and analyze two-variable data using scatterplots. They understand the concept of equally likely events and use it to find probabilities. They also find the number of arrangements of objects using the Basic Counting Principle.

Standard 7 — Problem Solving

In a general sense, mathematics is problem solving. In all of their mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. As they develop their skills with irrational numbers, analyzing graphs, or finding surface areas, for example, students move from simple ideas to more complex ones by taking logical steps that build a better understanding of mathematics.

As part of their instruction and assessment, students should also develop the following learning skills by Grade 12 that are woven throughout the mathematics Standards:

Communication

The ability to read, write, listen, ask questions, think, and communicate about math will develop and deepen students' understanding of mathematical concepts. Students should read text, data, tables, and graphs with comprehension and understanding. Their writing should be detailed and coherent, and they should use correct mathematical vocabulary. Students should write to explain answers, justify mathematical reasoning, and describe problem-solving strategies.

Reasoning and Proof

Mathematics is developed by using known ideas and concepts to develop others. Repeated addition becomes multiplication. Multiplication of numbers less than ten can be extended to numbers less than one hundred and then to the entire number system. Knowing how to find the area of a right triangle extends to all right triangles. Extending patterns, finding even numbers, developing formulas, and proving the Pythagorean Theorem are all examples of mathematical reasoning. Students should learn to observe, generalize, make assumptions from known information, and test their assumptions.

Representation

The language of mathematics is expressed in words, symbols, formulas, equations, graphs, and data displays. The concept of one-fourth may be described as a quarter, ¼, one divided by four, 0.25, ⅛ + ⅛, 25 percent, or an appropriately shaded portion of a pie graph. Higher-level mathematics involves the use of more powerful representations: exponents, logarithms, π, unknowns, statistical representation, algebraic and geometric expressions. Mathematical operations are expressed as representations: +, =, divide, square. Representations are dynamic tools for solving problems and communicating and expressing mathematical ideas and concepts.

Connections

Connecting mathematical concepts includes linking new ideas to related ideas learned previously, helping students to see mathematics as a unified body of knowledge whose concepts build upon each other. Major emphasis should be given to ideas and concepts across mathematical content areas that help students see that mathematics is a web of closely connected ideas (algebra, geometry, the entire number system). Mathematics is also the common language of many other disciplines (science, technology, finance, social science, geography) and students should learn mathematical concepts used in those disciplines. Finally, students should connect their mathematical learning to appropriate real-world contexts.

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Standard 1

Number Sense

Students know the properties of rational and irrational* numbers expressed in a variety of forms. They understand and use exponents*, powers, and roots.*

8.1.1 Read, write, compare, and solve problems using decimals in scientific notation*.

Example: Write 0.00357 in scientific notation.

8.1.2 Know that every rational number is either a terminating or repeating decimal and that every irrational number is a non-repeating decimal.

Example: Recognize that 2.375 is a terminating decimal, 5.121212... is a repeating decimal, and that $\pi = 3.14159265...$ is a non-repeating decimal. Name a rational number. Explain your reasoning.

8.1.3 Understand that computations with an irrational number and a rational number (other than zero) produce an irrational number.

Example: Tell whether the product of 7 and π is rational or irrational. Explain how you know that your answer is correct.

8.1.4 Understand and evaluate negative integer* exponents.

Example: Write 2^{-3} as a fraction.

8.1.5 Use the laws of exponents for integer exponents.

Example: Write $2^2 \times 2^3$ as $2 \times 2 \times \ldots$ and then as a single power of 2. Explain what you are doing.

8.1.6 Use the inverse relationship between squaring and finding the square root of a perfect square integer.

Example: Find the value of $(\sqrt{144})^2$.

8.1.7 Calculate and find approximations of square roots.

Example: For an integer that is not a perfect square, find the two integers (one larger, one smaller) that are closest to its square root and explain your reasoning.

* rational number: any number that can be written as a ratio of two integers* (e.g., $\frac{1}{2}$, $\frac{5}{6}$, $\frac{3}{9}$)

* integers: ..., -3, -2, -1, 0, 1, 2, 3, ...

* irrational number: any number that cannot be written as a ratio of two integers (e.g., π, $\sqrt{3}$, 7π)

* exponent: e.g., the exponent 4 in 3^4 tells you to write four 3s and compute $3 \times 3 \times 3 \times 3$

* scientific notation: a shorthand way of writing numbers using powers of ten (e.g., $300{,}000 = 3 \times 10^5$, $0.0000005 = 5 \times 10^{-7}$)

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Standard 2

Computation

Students compute with rational numbers expressed in a variety of forms. They solve problems involving ratios, proportions, and percentages.*

8.2.1 Add, subtract, multiply, and divide rational numbers (integers*, fractions, and terminating decimals) in multi-step problems.

Example: $-3.4 + 2.8 \times 5.75 = ?$, $1\frac{4}{5} + -\frac{3}{8} \times 2\frac{2}{9} = ?$, $81.04 \div 17.4 - 2.79 = ?$

8.2.2 Solve problems by computing simple and compound interest.

Example: You leave $100 in each of three bank accounts paying 5% interest per year. One account pays simple interest, one pays interest compounded annually, and the third pays interest compounded quarterly. Use a spreadsheet to find the amount of money in each account after one year, two years, three years, ten years, and twenty years. Compare the results in the three accounts and explain how compounding affects the balance in each account.

8.2.3 Use estimation techniques to decide whether answers to computations on a calculator are reasonable.

Example: Your friend says that 15% of $25 is $375. Without solving, explain why you think the answer is wrong.

8.2.4 Use mental arithmetic to compute with common fractions, decimals, powers, and percents.

Example: Find 20% of $50 without using pencil and paper.

* rational number: any number that can be written as a ratio of two integers* (e.g., $\frac{1}{2}$, $\frac{5}{6}$, $\frac{23}{9}$)

* integers: ..., -3, -2, -1, 0, 1, 2, 3, ...

Mathematics

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Standard 3

Algebra and Functions

Students solve simple linear equations and inequalities. They interpret and evaluate expressions involving integer powers. They graph and interpret functions. They understand the concepts of slope* and rate.*

8.3.1 Write and solve linear equations and inequalities in one variable, interpret the solution or solutions in their context, and verify the reasonableness of the results.

Example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be least $100. Write an inequality for the number of sales you need to make, solve it, and check that your answer is reasonable.

8.3.2 Solve systems of two linear equations using the substitution method and identify approximate solutions graphically.

Example: Solve the system. $2x + 3y = 6$
$y = 0$

8.3.3 Interpret positive integer powers as repeated multiplication and negative integer powers as repeated division or multiplication by the multiplicative inverse.

Example: Use a spreadsheet to explore the relationship between positive and negative integer powers by making a table of values of powers of 3, from 3^{-5} to 3^5.

8.3.4 Use the correct order of operations to find the values of algebraic expressions involving powers.

Example: Use a scientific calculator to find the value of $3(2x + 5)^2$ when $x = -35$.

8.3.5 Identify and graph linear functions and identify lines with positive and negative slope.

Example: Draw the graphs of $y = 2x - 1$, $y = 3x - 1$, $y = -2x - 1$, $y = -3x - 1$. Find the slope of each graph. What do you notice?

8.3.6 Find the slope of a linear function given the equation and write the equation of a line given the slope and any point on the line.

Example: Write an equation of the line with slope 2 and y-intercept -4.

8.3.7 Demonstrate an understanding of rate as a measure of one quantity with respect to another quantity.

Example: A car moving at a constant speed travels 90 km in 2 hours, 135 km in 3 hours, 180 km in 4 hours, etc. Draw a graph of distance as a function of time and find the slope of the graph. Explain what the slope tells you about the movement of the car.

8.3.8 Demonstrate an understanding of the relationships among tables, equations, verbal expressions, and graphs of linear functions.

Example: Write an equation that represents the verbal description: "the perimeter of a square is four times the side length." Construct a table of values for this relationship and draw its graph.

8.3.9 Represent simple quadratic functions using verbal descriptions, tables, graphs, and formulas and translate among these representations.

Example: Draw the graph of $y = x^2$, $y = 2x^2$, and $y = 3x^2$. Describe their similarities and differences.

8.3.10 Graph functions of the form $y = nx^2$ and $y = nx^3$ and describe the similarities and differences in the graphs.

Example: Draw the graphs of $y = 2x^2$ and $y = 2x^3$. Explain which graph shows faster growth.

* integers: ..., -3, -2, -1, 0, 1, 2, 3, ...

* slope: between any two points on a line, the slope is the change in vertical distance divided by the change in horizontal distance ("rise" over "run")

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Standard 4

Geometry

Students deepen their understanding of plane and solid geometric shapes and properties by constructing shapes that meet given conditions, by identifying attributes of shapes, and by applying geometric concepts to solve problems.

8.4.1 Identify and describe basic properties of geometric shapes: altitudes*, diagonals, angle and perpendicular bisectors*, central angles*, radii, diameters, and chords*.

Example: Describe a central angle of a circle in words and draw a diagram.

8.4.2 Perform simple constructions, such as bisectors of segments and angles, copies of segments and angles, and perpendicular segments. Describe and justify the constructions.

Example: Explain the procedures used to construct the three angle bisectors of a triangle.

8.4.3 Identify properties of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more figures intersect in a plane or in space.

Example: Find two lines in your classroom that are not parallel, yet do not meet.

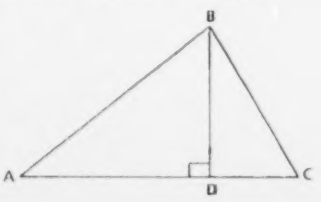
8.4.4 Draw the translation (slide), rotation (turn), reflection (flip), and dilation (stretches and shrinks) of shapes.

Example: Draw a rectangle and slide it 3 inches horizontally across your page. Then rotate it clockwise through 90° about the bottom left vertex. Draw the new rectangle in a different color.

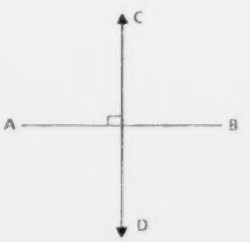
8.4.5 Use the Pythagorean Theorem and its converse to solve problems in two and three dimensions.

Example: Measure the dimensions of a shoe box and calculate the length of a diagonal from the top right to the bottom left of the box. Measure with a string to evaluate your solution.

* altitude: line segment from vertex of triangle to meet the line containing the opposite side in a right angle (altitude is $\overline{BD}$ in $\triangle ABC$)

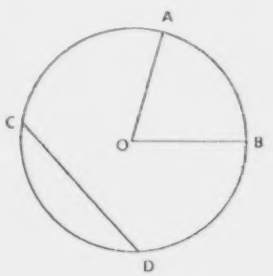


* perpendicular bisector: line (or ray or line segment) at right angles to given line segment and dividing it in half ($\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$)



* central angle: angle formed by joining two points on a circle to the center ($\angle AOB$ is a central angle)

* chord: line segment joining two points on a circle ($\overline{CD}$ is a chord)



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Standard 5

Measurement

Students convert between units of measure and use rates and scale factors to solve problems. They compute the perimeter, area, and volume of geometric objects. They investigate how perimeter, area, and volume are affected by changes of scale.

8.5.1 **Convert common measurements for length, area, volume, weight, capacity, and time to equivalent measurements within the same system.**

Example: The area of a hall is 40 square yards. What is the area in square feet?

8.5.2 **Solve simple problems involving rates and derived measurements for attributes such as velocity and density.**

Example: A car travels at 60 mph for 20 minutes. How far does it travel? What units are appropriate for distance? Explain your answer.

8.5.3 **Solve problems involving scale factors, area, and volume using ratio and proportion.**

Example: Calculate the volume and surface area of cubes with side 1 cm, 2 cm, 3 cm, etc. Make a table of your results and describe any patterns in the table.

8.5.4 **Use formulas for finding the perimeter and area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms*, trapezoids*, triangles, circles, prisms*, cylinders, spheres, cones, and pyramids.**

Example: Find the total surface area of a right triangular prism 14 feet high and with a base that measures 8 feet by 6 feet.

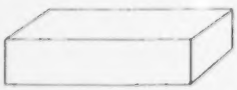
8.5.5 **Estimate and compute the area and volume of irregular two- and three-dimensional shapes by breaking the shapes down into more basic geometric objects.**

Example: Find the volume of a dog house that has a rectangular space that is 3 ft by 2 ft by 5 ft and has a triangular roof that is 1.5 ft higher than the walls of the house.

* parallelogram: a four-sided figure with both pairs of opposite sides parallel

* trapezoid: a four-sided figure with one pair of opposite sides parallel

* prism: solid shape with fixed cross-section (right prism is a solid shape with two parallel faces that are polygons and other faces that are rectangles)



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Standard 6

Data Analysis and Probability

Students collect, organize, represent, and interpret relationships in data sets that have one or more variables. They determine probabilities and use them to make predictions about events.

8.6.1 Identify claims based on statistical data and, in simple cases, evaluate the reasonableness of the claims. Design a study to investigate the claim.

Example: A study shows that teenagers who use a certain brand of toothpaste have fewer cavities than those using other brands. Describe how you can test this claim in your school.

8.6.2 Identify different methods of selecting samples, analyzing the strengths and weaknesses of each method, and the possible bias in a sample or display.

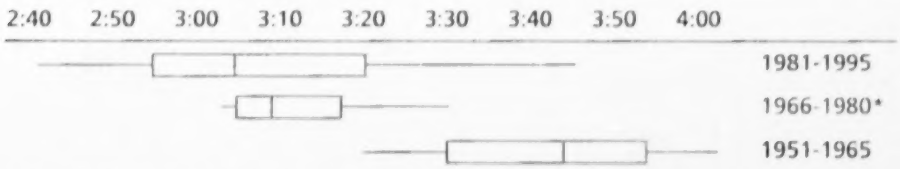
Example: Describe possible bias in the following survey: A local television station has a daily call-in poll. Viewers of the morning and noon newscasts are asked to call one telephone number to answer "yes" and a different telephone number to answer "no." The results are reported on the six-o'clock newscast.

8.6.3 Understand the meaning of, and be able to identify or compute the minimum value, the lower quartile*, the median*, the upper quartile*, the interquartile range, and the maximum value of a data set.

Example: Arrange a set of test scores in increasing order and find the lowest and highest scores, the median, and the upper and lower quartiles.

8.6.4 Analyze, interpret, and display single- and two-variable data in appropriate bar, line, and circle graphs; stem-and-leaf plots*; and box-and-whisker plots* and explain which types of display are appropriate for various data sets.

Example: The box-and-whisker plots below show winning times (hours: minutes) for the Indianapolis 500 race in selected years:



*Except 1967, 1973, 1975, and 1976.

In the years from 1951-1965, the slowest time was 3 h 57 min. Explain how the slowest time changed through the years 1951-1995. How did winning times change during that period? How did the median times change in the same period?

8.6.5 Represent two-variable data with a scatterplot* on the coordinate plane and describe how the data points are distributed. If the pattern appears to be linear, draw a line that appears to best fit the data and write the equation of that line.

Example: Survey some of the students at each grade level in your school, asking them how much time they spend on homework. Plot the grade level and time of each student as a point (grade, time) on a scatter diagram. Describe and justify any relationship between grade and time spent on homework.

8.6.6 Understand and recognize equally likely events.

Example: When you roll a number cube, what is the probability that the number on the top face will be a 6? Explain your answer.

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8.6.7 Find the number of possible arrangements of several objects by using the Basic Counting Principle.

Example: You are planning to place four pictures in a line on a shelf. Find the number of ways you can arrange the four pictures.

* lower quartile: the value that separates the lowest one-fourth of the values from the rest of the values
* median: the value that divides a set of data written in order of size into two equal parts
* upper quartile: the value that separates the highest one-fourth of the values from the rest of the values
* stem-and-leaf plot: e.g., this one shows 62, 63, 67, 71, 75, 75, 76, etc.

Stem	Leaf
6	2 3 7
7	1 5 5 6 8 9
8	0 1 1 2 3 5 5 7 8 8
9	1 2 2 3 3 4

* box-and-whisker plot: diagram showing median, quartiles, and range (see diagram on previous page)
* scatterplot: a coordinate graph showing ordered pairs of data

Standard 7

Problem Solving

Students make decisions about how to approach problems and communicate their ideas.

8.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.

Example: Solve the problem: "For computers, binary numbers are great because they are simple to work with and they use just two values of voltage, magnetism, or other signal. This makes hardware easier to design and more noise resistant. Binary numbers let you represent any amount you want using just two digits: 0 and 1. The number you get when you count ten objects is written 1010. In expanded notation, this is $1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$. Write the number for thirteen in the binary (base 2) system." Decide to make an organized list.

8.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.

Example: In the first example, if you have only two symbols, 0 and 1, then one object: 1, two objects: 10, three objects: 11, four objects: 100. Predict the symbol for five objects.

8.7.3 Decide when and how to divide a problem into simpler parts.

Example: In the first example, write expanded notation for the number five in base 2; begin with the fact that $5 = 4 + 1$.

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Students use strategies, skills, and concepts in finding and communicating solutions to problems.

8.7.4 Apply strategies and results from simpler problems to solve more complex problems.

Example: In the first example, write the first five numbers in base 2 notation and look for a pattern.

8.7.5 Make and test conjectures by using inductive reasoning.

Example: In the first example, predict the base 2 notation for six objects, then use expanded notation to test your prediction.

8.7.6 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.

Example: In the first example, explain how you will find the base two notation for thirteen objects.

8.7.7 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

Example: Measure the length and width of a basketball court. Use the Pythagorean Theorem to calculate the length of a diagonal. How accurately should you give your answer?

8.7.8 Select and apply appropriate methods for estimating results of rational-number computations.

Example: Use a calculator to find the cube of 15. Check your answer by finding the cubes of 10 and 20.

8.7.9 Use graphing to estimate solutions and check the estimates with analytic approaches.

Example: Use a graphing calculator to draw the straight line $x + y = 10$. Use this to estimate solutions of the inequality $x + y > 10$ by testing points on each side of the line.

8.7.10 Make precise calculations and check the validity of the results in the context of the problem.

Example: In the first example, list the first thirteen numbers in base 2 notation. Use patterns or expanded notation to confirm your list.

Students determine when a solution is complete and reasonable, and move beyond a particular problem by generalizing to other situations.

8.7.11 Decide whether a solution is reasonable in the context of the original situation.

Example: In the basketball court example, does the accuracy of your answer depend on your initial measuring?

8.7.12 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.

Example: In the first example, use your list of base 2 numbers to add numbers in base 2. Explain exactly how your addition process works.

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NOTES

Grade 8

Science

Science

Beginning with Grade 6, the Indiana Academic Standards for science contain seven Standards, with the addition of Historical Perspectives. Each Standard is described below. On the pages that follow, age-appropriate concepts are listed underneath each Standard. These ideas build a foundation for understanding the intent of each Standard.

Standard 1 — The Nature of Science and Technology

It is the union of science and technology that forms the scientific endeavor and that makes it so successful. Although each of these human enterprises has a character and history of its own, each is dependent on and reinforces the other. This first Standard draws portraits of science and technology that emphasize their roles in the scientific endeavor and reveal some of the similarities and connections between them. In order for students to truly understand the nature of science and technology, they must model the process of scientific investigation through inquiries, fieldwork, lab work, etc. Through these experiences, students will practice designing investigations and experiments, making observations, and formulating theories based on evidence.

Standard 2 — Scientific Thinking

There are certain thinking skills associated with science, mathematics, and technology that young people need to develop during their school years. These are mostly, but not exclusively, mathematical and logical skills that are essential tools for both formal and informal learning and for a lifetime of participation in society as a whole. Good communication is also essential in order to both receive and disseminate information and to understand others' ideas as well as have one's own ideas understood. Writing, in the form of journals, essays, lab reports, procedural summaries, etc., should be an integral component of students' experiences in science.

Standard 3 — The Physical Setting

One of the grand success stories of science is the unification of the physical universe. It turns out that all natural objects, events, and processes are connected to each other. This Standard contains recommendations for basic knowledge about the overall structure of the universe and the physical principles on which it seems to run, with emphasis on Earth and the solar system. This Standard focuses on two principle subjects: the structure of the universe and the major processes that have shaped planet Earth, and the concepts with which science describes the physical world in general – organized under the headings of *Matter and Energy* and *Forces of Nature*. In Grade 8, students refine their knowledge about the relationships between physical objects, events, and processes in the universe.

Standard 4 — The Living Environment

People have long been curious about living things – how many different species there are, what they are like, how they relate to each other, and how they behave. Living organisms are made of the same components as all other matter, involve the same kinds of transformations of energy, and move using the same basic kinds of forces. Thus, all of the physical principles discussed in Standard 3 – The Physical Setting, apply to life as well as to stars, raindrops, and television sets. This Standard offers recommendations on basic knowledge about how living things function and how they interact with one another and their environment. In Grade 8, students trace the flow of matter and energy through ecosystems and recognize that the total amount of matter stays constant.

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Standard 5 — The Mathematical World

Mathematics is essentially a process of thinking that involves building and applying abstract, logically connected networks of ideas. These ideas often arise from the need to solve problems in science, technology, and everyday life – problems ranging from how to model certain aspects of a complex scientific problem to how to balance a checkbook.

Standard 6 — Historical Perspectives

Examples of historical events provide a context for understanding how the scientific enterprise operates. By studying these events, one understands that new ideas are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and grow or transform slowly through the contributions of many different investigators. The historical events listed in Grade 8 are certainly not the only events that could be used to illustrate this Standard, but they provide an array of examples. Through these examples, students will gain insight into chemistry, specifically that of nuclear chemistry.

Standard 7 — Common Themes

Some important themes pervade science, mathematics, and technology and appear over and over again, whether we are looking at ancient civilization, the human body, or a comet. These ideas transcend disciplinary boundaries and prove fruitful in explanation, in theory, in observation, and in design. A focus on *Constancy and Change* within this Standard provides students opportunities to engage in long-term and on-going laboratory and fieldwork, and thus understand the role of change over time in studying The Physical Setting and The Living Environment.

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Standard 1

The Nature of Science and Technology

Students design and carry out increasingly sophisticated investigations. They understand the reason for isolating and controlling variables in an investigation. They realize that scientific knowledge is subject to change as new evidence arises. They examine issues in the design and use of technology, including constraints, safeguards, and trade-offs.

The Scientific View of the World

8.1.1 Recognize that and describe how scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory* leads to looking at old observations in a new way.

8.1.2 Recognize and explain that some matters cannot be examined usefully in a scientific way.

* theory: an explanation supported by substantial evidence

Scientific Inquiry

8.1.3 Recognize and describe that if more than one variable changes at the same time in an experiment, the outcome of the experiment may not be attributable to any one of the variables.

The Scientific Enterprise

8.1.4 Explain why accurate record keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society.

8.1.5 Explain why research involving human subjects requires that potential subjects be fully informed about the risks and benefits associated with the research and that they have the right to refuse to participate.

Technology and Science

8.1.6 Identify the constraints that must be taken into account as a new design is developed, such as gravity and the properties of the materials to be used.

8.1.7 Explain why technology issues are rarely simple and one-sided because contending groups may have different values and priorities.

8.1.8 Explain that humans help shape the future by generating knowledge, developing new technologies, and communicating ideas to others.

Standard 2

Scientific Thinking

Students use computers to organize and compare information. They perform calculations and determine the appropriate units for the answers. They weigh the evidence for or against an argument, as well as the logic of the conclusions.

Computation and Estimation

8.2.1 Estimate distances and travel times from maps and the actual size of objects from scale drawings.

8.2.2 Determine in what units, such as seconds, meters, grams, etc., an answer should be expressed based on the units of the inputs to the calculation.

Manipulation and Observation

8.2.3 Use proportional reasoning to solve problems.

8.2.4 Use technological devices, such as calculators and computers, to perform calculations.

8.2.5 Use computers to store and retrieve information in topical, alphabetical, numerical, and keyword files and create simple files of students' own devising.

Communication

8.2.6 Write clear, step-by-step instructions (procedural summaries) for conducting investigations, operating something, or following a procedure.

8.2.7 Participate in group discussions on scientific topics by restating or summarizing accurately what others have said, asking for clarification or elaboration, and expressing alternative positions.

8.2.8 Use tables, charts, and graphs in making arguments and claims in, for example, oral and written presentations about lab or fieldwork.

Critical Response Skills

8.2.9 Explain why arguments are invalid if based on very small samples of data, biased samples, or samples for which there was no control sample.

8.2.10 Identify and criticize the reasoning in arguments in which fact and opinion are intermingled or the conclusions do not follow logically from the evidence given, an analogy is not apt, no mention is made of whether the control group is very much like the experimental group, or all members of a group are implied to have nearly identical characteristics that differ from those of other groups.

Standard 3

The Physical Setting

Students collect and organize data to identify relationships between physical objects, events, and processes. They use logical reasoning to question their own ideas as new information challenges their conceptions of the natural world.

The Universe

8.3.1 Explain that large numbers of chunks of rock orbit the sun and some of this rock interacts with Earth.

The Earth and the Processes That Shape It

8.3.2 Explain that the slow movement of material within Earth results from heat flowing out of the deep interior and the action of gravitational forces on regions of different density*.

8.3.3 Explain that the solid crust of Earth, including both the continents and the ocean basins, consists of separate plates that ride on a denser, hot, gradually deformable layer of earth. Understand that the crust sections move very slowly, pressing against one another in some places, pulling apart in other places. Further understand that ocean-floor plates may slide under continental plates, sinking deep into Earth, and that the surface layers of these plates may fold, forming mountain ranges.

8.3.4 Explain that earthquakes often occur along the boundaries between colliding plates, and molten rock from below creates pressure that is released by volcanic eruptions, helping to build up mountains. Understand that under the ocean basins, molten rock may well up between separating plates to create new ocean floor. Further understand that volcanic activity along the ocean floor may form undersea mountains, which can thrust above the ocean's surface to become islands.

8.3.5 Explain that everything on or anywhere near Earth is pulled toward Earth's center by a gravitational force.

8.3.6 Understand and explain that the benefits of Earth's resources, such as fresh water, air, soil, and trees, are finite and can be reduced by using them wastefully or by deliberately or accidentally destroying them.

8.3.7 Explain that the atmosphere and the oceans have a limited capacity to absorb wastes and recycle materials naturally.

* density: the density of a sample is the sample's mass* divided by its volume

* mass: the amount of matter* in an object

* matter: anything that has mass and takes up space

Matter and Energy*

8.3.8 Explain that all matter is made up of atoms* which are far too small to see directly through an optical microscope. Understand that the atoms of any element* are similar but are different from atoms of other elements. Further understand that atoms may stick together in well defined molecules or may be packed together in large arrays. Also understand that different arrangements of atoms into groups comprise all substances.

8.3.9 Demonstrate, using drawings and models, the movement of atoms in a solid*, liquid*, and gaseous* state. Explain that atoms and molecules are perpetually in motion.

8.3.10 Explain that increased temperature means that atoms have a greater average energy of motion and that most gases expand when heated.

8.3.11 Describe how groups of elements can be classified based on similar properties, including highly reactive metals*, less reactive metals, highly reactive non-metals*, less reactive non-metals, and some almost completely non-reactive gases.

8.3.12 Explain that no matter how substances within a closed system interact with one another, or how they combine or break apart, the total mass of the system remains the same. Understand that the atomic theory explains the conservation of matter: if the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same.

8.3.13 Explain that energy cannot be created or destroyed but only changed from one form into another.

8.3.14 Describe how heat* can be transferred through materials by the collision of atoms, or across space by radiation*, or if the material is fluid, by convection* currents that are set up in it that aid the transfer of heat.

8.3.15 Identify different forms of energy that exist in nature.

* energy: what is needed to do work*
* work: a force* acting over a distance to move an object
* force: a push or a pull that can cause a change in the motion* of the object
* motion: a change in position of an object in a certain amount of time
* atom: smallest particle of an element that has the properties of that element
* element: the simplest type of pure substance; a substance consisting entirely of atoms having identical chemical properties
* solid: matter with a definite shape and volume
* liquid: matter with no definite shape but with a definite volume
* gas: matter with no definite shape or volume
* metals: one class of substances that are mostly shiny, bendable, and good conductors of heat and electricity
* non-metals: one class of substances that does not have metallic properties; usually a poor conductor of heat and electricity
* heat: a form of energy characterized by random motion at the molecular level
* radiation: energy transfer through space
* convection: heat transfer in liquids and gases by transport of matter from a region of one temperature to a region of a different temperature

Forces of Nature

8.3.16 Explain that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

8.3.17 Explain that the sun's gravitational pull holds Earth and the other planets in their orbits, just as the planets' gravitational pull keeps their moons in orbit around them.

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8.3.18 Investigate and explain that electric currents and magnets can exert force on each other.

8.3.19 Investigate and compare series and parallel circuits.

8.3.20 Compare the differences in power consumption in different electrical devices.

Standard 4

The Living Environment

Students trace the flow of matter and energy through ecosystems. They understand that the total amount of matter remains constant and that almost all food energy has its origin in sunlight.*

Diversity of Life

8.4.1 Differentiate between inherited traits, such as hair color or flower color, and acquired skills, such as manners.

8.4.2 Describe that in some organisms, such as yeast or bacteria, all genes* come from a single parent, while in those that have sexes, typically half of the genes come from each parent.

8.4.3 Recognize and describe that new varieties of cultivated plants, such as corn and apples, and domestic animals, such as dogs and horses, have resulted from selective breeding for particular traits.

* ecosystem: a group of organisms in an area that interact with one another, together with their non-living environment

* gene: basic unit of heredity

Interdependence of Life and Evolution

8.4.4 Describe how matter is transferred from one organism to another repeatedly and between organisms and their physical environment.

8.4.5 Explain that energy can be transferred from one form to another in living things.

8.4.6 Describe how animals get their energy from oxidizing their food and releasing some of this energy as heat.

8.4.7 Recognize and explain that small genetic differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors.

8.4.8 Describe how environmental conditions affect the survival of individual organisms and how entire species may prosper in spite of the poor survivability or bad fortune of individuals.

Human Identity

8.4.9 Recognize and describe that fossil evidence is consistent with the idea that human beings evolved from earlier species*.

* species: a category of biological classification that is comprised of organisms sufficiently and closely related as to be potentially able to mate with one another.

Standard 5

The Mathematical World

Students apply mathematics in scientific contexts. Students use mathematical ideas, such as symbols, geometrical relationships, statistical relationships, and the use of key words and rules in logical reasoning, in the representation and synthesis of data.

Numbers

8.5.1 Understand and explain that a number must be written with an appropriate number of significant figures (determined by the measurements from which the number is derived).

Shapes and Symbolic Relationships

8.5.2 Show that an equation containing a variable may be true for just one value of the variable.

8.5.3 Demonstrate that mathematical statements can be used to describe how one quantity changes when another changes.

8.5.4 Illustrate how graphs can show a variety of possible relationships between two variables.

8.5.5 Illustrate that it takes two numbers to locate a point on a map or any other two-dimensional surface.

Reasoning and Uncertainty

8.5.6 Explain that a single example can never prove that something is always true, but it could prove that something is not always true.

8.5.7 Recognize and describe the danger of making over-generalizations when inventing a general rule based on a few observations.

8.5.8 Explain how estimates can be based on data from similar conditions in the past or on the assumption that all the possibilities are known.

8.5.9 Compare the mean*, median*, and mode* of a data set.

8.5.10 Explain how the comparison of data from two groups involves comparing both their middles and the spreads.

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* mean: the average obtained by adding the values and dividing by the number of values
* median: the value that divides a set of data, written in order of size, into two equal parts
* mode: the most common value in a given data set

Standard 6

Historical Perspectives

Students gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, they understand that new ideas are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and grow or transform slowly through the contributions of many different investigators.

8.6.1 Understand and explain that Antoine Lavoisier's work was based on the idea that when materials react with each other, many changes can take place, but that in every case the total amount of matter afterward is the same as before. Note that Lavoisier successfully tested the concept of conservation of matter by conducting a series of experiments in which he carefully measured the masses of all the substances involved in various chemical reactions, including the gases used and those given off.

8.6.2 Understand and describe that the accidental discovery that minerals containing uranium darken photographic film, as light does, led to the discovery of radioactivity.

8.6.3 Understand that and describe how in their laboratory in France, Marie Curie and her husband, Pierre Curie, isolated two new elements that were the source of most of the radioactivity of uranium ore. Note that they named one radium because it gave off powerful, invisible rays, and the other polonium in honor of Madame Curie's country of birth, Poland. Also note that Marie Curie was the first scientist ever to win the Nobel Prize in two different fields, in physics, shared with her husband, and later in chemistry.

8.6.4 Describe how the discovery of radioactivity as a source of Earth's heat energy made it possible to understand how Earth can be several billion years old and still have a hot interior.

Standard 7

Common Themes

Students analyze the parts and interactions of systems to understand internal and external relationships. They investigate rates of change, cyclic changes, and changes that counterbalance one another. They use mental and physical models to reflect upon and interpret the limitations of such models.

Systems

8.7.1 Explain that a system usually has some properties that are different from those of its parts but appear because of the interaction of those parts.

8.7.2 Explain that even in some very simple systems, it may not always be possible to predict accurately the result of changing some part or connection.

Models and Scale

8.7.3 Use technology to assist in graphing and with simulations that compute and display results of changing factors in models.

8.7.4 Explain that as the complexity of any system increases, gaining an understanding of it depends on summaries, such as averages and ranges*, and on descriptions of typical examples of that system.

* range: the difference between the largest and the smallest value

Constancy and Change

8.7.5 Observe and describe that a system may stay the same because nothing is happening or because things are happening that counteract one another.

8.7.6 Recognize that and describe how symmetry may determine properties of many objects, such as molecules, crystals, organisms, and designed structures.

8.7.7 Illustrate how things, such as seasons or body temperature, occur in cycles.

Science

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NOTES

Grade 8

Social Studies

United States History – Growth and Development

In Grade 8, students focus upon United States history, beginning with a brief review of early history, including the Revolution and founding era, and the principles of the United States and Indiana constitutions, as well as other founding documents and their applications to subsequent periods of national history and to civic and political life. Students then study national development, westward expansion, social reform movements, and the Civil War and Reconstruction.

The K – 8 Indiana Academic Standards for social studies are organized around five content areas. The content area Standards and the types of learning experiences they provide to students in Grade 8 are described below. On the pages that follow, age-appropriate concepts are listed underneath each Standard. Skills for thinking, inquiry, and participation in a democratic society are integrated throughout. Specific terms are defined and examples are provided when necessary.

Standard 1 — History

Students will examine the relationship and significance of themes, concepts, and movements in the development of United States history, including review of key ideas related to the discovery, exploration, and colonization of America, and the revolution and founding era. This will be followed by emphasis on social reform, national development and westward expansion, and the Civil War and Reconstruction period.

Standard 2 — Civics and Government

Students will explain the major principles, values, and institutions of constitutional government and citizenship, which are based on the founding documents of the United States.

Standard 3 — Geography

Students will identify the major geographic characteristics of the United States and its regions. They will name and locate the major physical features of the United States, each of the states, and major cities, and use geographic skills and technology to examine the influence of geographic factors on national development.

Standard 4 — Economics

Students will identify, describe, and evaluate the influence of economic factors on national development from the founding of the nation to the end of Reconstruction.

Standard 5 — Individuals, Society, and Culture

Students will examine the influence of individuals, ideas, and cultural movements in the development of the United States, consider the impact of scientific and technological developments on cultural life, and analyze the importance of artistic expression in the development of the American nation.

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Standard 1

History

Students will examine the relationship and significance of themes, concepts, and movements in the development of United States history, including review of key ideas related to the discovery, exploration, and colonization of America, and the revolution and founding era. This will be followed by emphasis on social reform, national development and westward expansion, and the Civil War and Reconstruction period.

Historical Knowledge

The American Revolution and Founding of the United States of America: 1754 to 1801

8.1.1 Describe major Indian groups of eastern North America, including early conflict with European settlers.

8.1.2 Compare and contrast the relationships among the British, French, Spanish, and Dutch in their struggle for control of North America during European settlement and colonization.

8.1.3 Identify and explain the conditions, causes, consequences, and significance of the French and Indian War (1754–1763), and the resistance and rebellion against British imperial rule by the thirteen colonies in North America (1761–1775).

8.1.4 Identify fundamental ideas in the Declaration of Independence (1776), and analyze the causes and effects of the Revolutionary War (1775–1783), including enactment of the Articles of Confederation and the Treaty of Paris.

8.1.5 Identify and explain key events leading to the creation of a strong union among the thirteen original states and in the establishment of the United States as a federal republic.

> Example: The enactment of state constitutions, the Constitutional Convention, ratifying conventions of the American states, and debate by Federalists versus Anti-Federalists about approval or disapproval of the 1787 Constitution (1787–1788).

8.1.6 Identify the steps in the implementation of the federal government under the United States Constitution, including the First and Second Congresses of the United States (1789–1792).

8.1.7 Describe the origin and development of political parties, the Federalists, and the Democratic Republicans (1793–1801).

8.1.8 Evaluate the significance of the presidential and congressional election of 1800 and the transfer of political authority and power to the Democratic-Republican party led by the new President, Thomas Jefferson (1801).

8.1.9 Describe the influence of individuals on social and political developments.

> Example: James Otis, Mercy Otis Warren, Samuel Adams, Thomas Paine, George Washington, John Adams, Abigail Adams, Patrick Henry, Thomas Jefferson, James Madison, Alexander Hamilton, and Benjamin Banneker.

8.1.10 Compare differences in ways of life in the northern and southern states, including the growth of towns and cities in the North and the growing dependence on slavery in the South.

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National Expansion and Reform: 1801 to 1861

8.1.11 Explain the events leading up to and the significance of the Louisiana Purchase (1803) and the expedition of Lewis and Clark (1803–1806).

8.1.12 Explain the main issues, decisions, and consequences of landmark Supreme Court cases: *Marbury v. Madison* (1803), *McCulloch v. Maryland* (1819), and *Gibbons v. Ogden* (1824).

8.1.13 Explain the causes and consequences of the War of 1812, including the Rush-Bagot Agreement (1818).

8.1.14 Examine the international problem that led to the Monroe Doctrine (1823) and assess its consequences.

8.1.15 Explain the concept of Manifest Destiny and its relationship to the westward movement of settlers and territorial expansion, including the purchase of Florida (1819), the annexation of Texas (1845), the acquisition of the Oregon Territory (1846), and territorial acquisition resulting from the Mexican War (1846–1848).

8.1.16 Describe the abolition of slavery in the northern states, conflict and compromises associated with westward expansion of slavery, such as the Missouri Compromise (1820), and the continued resistance to slavery by African Americans.

8.1.17 Identify the key ideas of Jacksonian democracy, and explain their influence on political participation, political parties, and constitutional government.

8.1.18 Analyze different interests and points of view of individuals and groups involved in the abolitionist, feminist, and social reform movements and in sectional conflicts.

8.1.19 Describe the impact of the California gold rush (1849) on the westward expansion of the United States.

8.1.20 Explain the influence of individuals on key events and developments of the early United States.

Example: Thomas Jefferson, Robert Fulton, Meriwether Lewis, William Clark, Sacajewea, Daniel Boone, Little Turtle, Tecumseh, Black Hawk, John Marshall, James Madison, Dolley Madison, Andrew Jackson, John C. Calhoun, Henry Clay, Daniel Webster, James Polk, Elizabeth Cady Stanton, William Lloyd Garrison, Frederick Douglass, Horace Mann, Dorothea Dix, and Lucretia Mott.

The Civil War and Reconstruction Period: 1850 to 1877

8.1.21 Analyze the causes and effects of events leading to the Civil War, including development of sectional conflict over slavery.

Example: The Compromise of 1850, furor over publication of Uncle Tom's Cabin (1852), Kansas-Nebraska Act (1854), the Dred Scott Case (1857), the Lincoln-Douglas Debates (1858), and the presidential election of 1860.

8.1.22 Describe the importance of key events in the Civil War, including the battles of Antietam, Vicksburg, and Gettysburg, and the Emancipation Proclamation and Gettysburg Address (1861 to 1865).

8.1.23 Explain and evaluate the policies, practices, and consequences of Reconstruction, including the Thirteenth, Fourteenth, and Fifteenth Amendments to the Constitution.

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8.1.24 Describe the conflicts between Indians and settlers of the Great Plains.

8.1.25 Identify the influence of individuals on political and social events and movements.

Example: Henry Clay, Harriet Tubman, Harriet Beecher Stowe, Roger Taney, Stephen A. Douglas, Abraham Lincoln, Frederick Douglass, John Brown, Jefferson Davis, Clara Barton, Robert E. Lee, Ulysses S. Grant, William T. Sherman, Andrew Johnson, Thaddeus Stevens, Susan B. Anthony, Sitting Bull, Crazy Horse, and Chief Joseph.

Chronological Thinking

8.1.26 Develop and interpret United States history timelines from 1750 to 1877 by designating appropriate intervals of time and recording events according to the chronological order in which they occurred.

Comprehension, Analysis, and Interpretation

8.1.27 Recognize historical perspective by identifying the historical context in which events unfolded and by avoiding evaluation of the past solely in terms of present-day norms.

8.1.28 Identify, evaluate, and distinguish fact from opinion in a variety of information resources*; differentiate between historical facts and interpretations, recognizing that the facts the historian reports reflects his or her judgment of what is most significant about the past.

8.1.29 Distinguish in historical narratives between unsupported expressions of opinion and informed hypotheses grounded in historical evidence.

* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

Research Capabilities

8.1.30 Form historical research questions and seek responses by analyzing primary resources, such as autobiographies, diaries, maps, photographs, letters, and government documents and secondary resources, such as biographies and other non-fiction books and articles on the history of the United States.

Example: Analyze and interpret the Virginia Statute for Religious Freedom (1786), President George Washington's Farewell Address (1796), the First Inaugural Address by Thomas Jefferson (1801), the Declaration of Sentiments and Resolutions of the Seneca Falls Convention (1848), and the Second Inaugural Address by Abraham Lincoln (1865).

Issues-Analysis, Decision-Making, Planning, and Problem Solving

8.1.31 Examine the causes of problems in the past, and evaluate solutions chosen as well as possible alternative courses of actions. Consider the information available at the time, the interests of those affected by the decision, and the consequences of each course of action.

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Standard 2

Civics and Government

Students will explain the major principles, values, and institutions of constitutional government and citizenship, which are based on the founding documents of the United States.

Foundations of Government

8.2.1 Identify and explain essential ideas of constitutional government, which are expressed in the founding documents of the United States of America, including the Virginia Declaration of Rights, the Declaration of Independence, Virginia Statute for Religious Freedom, Massachusetts Constitution of 1780, the Northwest Ordinance, the 1787 U.S. Constitution, Bill of Rights, Federalist and Anti-Federalist papers, Washington's Farewell Address (1796), and Jefferson's First Inaugural Address (1801).

Example: The essential ideas include limited government, rule of law, due process of law, separated and shared powers, checks and balances, federalism, popular sovereignty, republicanism, representative government, and individual rights to life, liberty, property, freedom of conscience, and due process of law.

8.2.2 Distinguish between a subject and a citizen.

Example: In a non-democratic political system, a subject passively follows the ruler or rulers. In a democratic political system, a citizen may play an active role in making laws or in selecting representatives to make them.

8.2.3 Identify and explain the relationship between rights and responsibilities of citizenship in the United States.

Example: The right to vote and the responsibility to use this right carefully and effectively.

8.2.4 Define and explain the importance of individual and civic responsibilities.

Example: Individual responsibilities might include taking care of yourself, accepting responsibility for the consequences of your actions, assuming the responsibility to become educated, and supporting your family. Civic responsibilities might include obeying the law, respecting the rights of others, being an informed citizen, becoming involved in civic affairs, monitoring the actions of governmental officials, communicating with elected representatives, voting, paying taxes, serving in the armed forces, and serving on juries.

8.2.5 Identify the ways that people become citizens of the United States.

Functions of Government

8.2.6 Define, compare, and contrast unitary*, federal*, and confederate* forms of governmental organization.

8.2.7 Distinguish between the different functions of national and state government within the federal system by analyzing the Constitution of the United States and the Indiana Constitution.

Example: Identify important services provided by state government, such as maintaining state roads and highways, enforcing health and safety laws, and supporting educational institutions. Compare those services to functions of the federal government, such as defense.

8.2.8 Explain how and why legislative, executive, and judicial powers are distributed, shared, and limited in the constitutional government of the United States.

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8.2.9 Examine functions of the national government in the lives of people, including purchasing and distributing public goods and services, financing government through taxation, conducting foreign policy, and providing a common defense.

* unitary system: a system that concentrates all governmental power in a central or national government
* federal system: a system in which power is divided and shared between national and state governments
* confederate system: a system of government in which sovereign states delegate powers to a national government for specific purposes

Roles of Citizens

8.2.10 Explain the importance in a democratic republic of responsible participation by citizens in voluntary civil associations/non-governmental organizations that comprise civil society.

8.2.11 Describe various types of elections, and explain ways that citizens can participate in political parties, campaigns, and elections, such as primary, general, state, local, and national elections.

8.2.12 Explain how citizens can monitor and influence the development and implementation of public policies.

8.2.13 Research and defend positions on issues in which fundamental values and principles related to the Constitution of the United States are in conflict, using a variety of information resources*.

Example: Majority rule and minority rights, liberty and equality, or individual rights and the common good.

* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

Standard 3

Geography

Students will identify the major geographic characteristics of the United States and its regions. They will name and locate the major physical features of the United States, each of the states, and major cities, and use geographic skills and technology to examine the influence of geographic factors on national development.

The World in Spatial Terms

8.3.1 Read a topographic map to interpret its symbols. Determine the land forms and human features that represent physical and cultural characteristics* of areas in the United States.

Places and Regions

8.3.2 Map and locate all states of the United States, major cities, mountain ranges, and river systems of the United States.

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* cultural characteristics: human features, such as population characteristics, communication and transportation networks, religion and customs, how people make a living or build homes and other structures

Physical Systems

8.3.3 Locate and map the major climate regions in the United States and describe the characteristics of each climate type.

8.3.4 Name and describe processes that build* up the land and processes that erode* it.

Example: The Appalachian Mountains are a formation that has undergone erosion.

* building: forces that build up the Earth's surface include mountain building and deposit of dirt by water, ice, and wind; the Mississippi Delta is made up almost entirely of eroded material

* eroding: forces that wear away the Earth include freezing and thawing water, glaciers, and wind

Human Systems

8.3.5 Identify the agricultural regions of the United States, and be able to give reasons for the type of land use during different historical periods.

8.3.6 Map changes in national boundaries, distribution of population, and economic activities at critical stages of development in the eighteenth and nineteenth centuries in the United States.

8.3.7 Analyze geographic factors that have influenced migration and settlement patterns, and relate them to the economic development of the United States.

Example: The presence of a major waterway influences economic development and the workers who are attracted to that development.

Environment and Society

8.3.8 Develop maps showing the distribution of natural resources, such as forests, water sources, wildlife in the United States at the beginning of the nineteenth century, and give examples of how people exploited these resources as the country became more industrialized and people moved westward.

8.3.9 Identify ways people modified the physical environment as the United States developed, and the types of problems that resulted.

Example: Identify urbanization*, deforestation*, and extinction* or near extinction of wildlife species.

* urbanization: the growth of cities

* deforestation: the clearing of trees or forests

* extinction: the state in which all members of a group of organisms, such as a species, population, family or class, have disappeared from a given habitat, geographic area, or the entire world

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Uses of Geography

8.3.10 Explain the importance of the major mountain ranges and the major river systems in the development of the United States in the eighteenth and nineteenth centuries.

Example: Locate major cities, and suggest reasons for their location and development.

8.3.11 Use information technology, such as Geographic Information Systems (GIS)* and remotely sensed images to gather information on ways people have changed the physical environment of the United States in the nineteenth century.

* Geographic Information Systems (GIS): information technology systems used to store, analyze, manipulate, and display a wide range of geographic information

Standard 4

Economics

Students will identify, describe, and evaluate the influence of economic factors on national development from the founding of the nation to the end of Reconstruction.

8.4.1 Identify economic factors contributing to the European exploration and colonization in North America and the American Revolution, and the drafting of the Constitution of the United States.

8.4.2 Illustrate elements of the three types of economic systems, using cases from United States history.

Example: Traditional economy*, command economy*, market economy*.

8.4.3 Evaluate how the characteristics of a market economy have affected the economic development of the United States.

Example: Characteristics included the role of entrepreneurs, private property, markets, competition, and self-interest.

8.4.4 Explain the basic economic functions of the government in the economy of the United States.

Example: The government provides a legal framework, promotes competition, provides public goods and services, controls the effects of market failures, and regulates interstate commerce.

8.4.5 Analyze contributions of entrepreneurs, inventors, and other key individuals in the development of the United States economy.

Example: Contributors included Alexander Hamilton, Lewis and Clark, Eli Whitney, Samuel Gompers, Madam C.J. Walker, Andrew Carnegie, and George Washington Carver.

8.4.6 Relate technological change and inventions to changes in labor productivity in the United States in the eighteenth and nineteenth centuries.

Example: The cotton gin increased labor productivity in the early nineteenth century.

8.4.7 Trace the development of different kinds of money used in the United States, and explain how money helps make saving easier.

Example: Types of money included wampum, tobacco, gold and silver, state bank notes, greenbacks, and Federal Reserve Notes.

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8.4.8 **Examine the development of the banking system in the United States.**

Example: Examine such elements as the central bank controversy, the state banking era, and the development of a gold standard.

8.4.9 **Explain and evaluate examples of domestic and international interdependence throughout United States history.**

Example: Triangular trade routes, regional exchange of resources.

8.4.10 **Examine the importance of borrowing and lending (the use of credit) in the United States, and list the advantages and disadvantages of using credit.**

8.4.11 **Compare and contrast job skills needed in different time periods in United States history, and use a variety of information resources* to research jobs and careers.**

* traditional economy: resources are allocated based on custom and tradition
* command economy: resources are allocated by the government or other central authority
* market economy: resources are allocated by decisions of individuals and businesses
* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

Standard 5

Individuals, Society, and Culture

Students will examine the influence of individuals, ideas, and cultural movements in the development of the United States; consider the impact of scientific and technological developments on cultural life, and analyze the importance of artistic expression in the development of the American nation.

8.5.1 **Examine key ideas of individuals in the Second Great Awakening, such as Henry Ward Beecher, and explain their relationship to social reform movements in the early decades of the 1800s.**

8.5.2 **Compare and contrast the beliefs of Ralph Waldo Emerson and Henry David Thoreau about the role of individuals in society.**

8.5.3 **Examine the concepts of a work ethic, philanthropy, volunteerism, and concern for the common good as important aspects of American society in the eighteenth and nineteenth centuries.**

Example: In the 1830s, French observer Alexis de Tocqueville noted the importance of volunteerism, the American tendency to form voluntary associations to address community needs.

8.5.4 **Trace the development of the American educational system, including the work of Horace Mann in the public schools movement (1830s to 1850s), and describe the differences in educational opportunities for girls and women, African Americans, and students in rural areas.**

8.5.5 **Give examples of how immigration affected American culture in the decades before and after the Civil War, including growth of industrial sites in the North, religious differences, tensions between middle class and working class people, particularly in the Northeast, and intensification of cultural differences between the North and the South.**

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8.5.6 Give examples of the changing role of women in the northern, southern, and western parts of the United States in the mid-nineteenth century, and examine possible causes for these changes.

8.5.7 Give examples of scientific and technological developments that changed cultural life in the nineteenth-century United States, such as the use of photography, the invention of the telegraph (1844), and the invention of the telephone (1876).

8.5.8 Identify individuals in the arts and literature and their roles in portraying American culture in the nineteenth century, including John James Audubon, George Catlin, Alfred Jacob Miller, George Caleb Bingham, Washington Irving, Frederick Douglass, Walt Whitman, Louisa May Alcott, Edgar Allan Poe, and Emily Dickinson.

8.5.9 Describe changes in entertainment and recreation, such as the growing interest in sports of various kinds in the mid-nineteenth century, and explain how these changes related to urbanization and technological developments.

8.5.10 Use a variety of information resources* to identify examples of traditional arts, fine arts, music, and literature that reflect the ideals of American democracy in different historical periods, and plan presentations on or performances of selected works.

* information resources: print media, including books, magazines, and newspapers; electronic media, such as radio, television, Web sites, and databases; and community resources, such as individuals and organizations

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NOTES

Questions?

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